

**A REVIEW OF THE GENUS *LIMNOMETRA* MAYR IN
NEW GUINEA, WITH THE DESCRIPTION OF A VERY LARGE
NEW SPECIES (HETEROPTERA: GERRIDAE)**

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Abstract.—The species of the water strider genus *Limnometra* occurring on New Guinea and proximate islands are reviewed, and a very large new species, *L. grallator*, is described from the southern flanks of the central highlands. On the basis of male endosomal sclerotization, this new species appears to be most closely related to *L. kallisto* (Kirkaldy), a much smaller species also endemic to greater New Guinea. A key to all New Guinea *Limnometra* species is provided, accompanied by illustrations of the male endosomal sclerites and range maps.

The genus *Limnometra* consists of a group of large, long legged water striders that are widely distributed across tropical Asia and eastward into the southwestern Pacific and northern Australia. The last complete generic revision of the genus was that of Hungerford and Matsuda (1958), following which no additional species were described for over 40 years. Recently, however, Nieser and Chen reviewed the Indo-Australian fauna (1992), describing 9 new species and producing a partial key. Subsequently, Andersen and Weir (1997) revised the genus for Australia, describing one new species, *L. cilioides*, keying the Australian taxa, and correcting certain errors contained in Nieser and Chen, including synonymy of their *L. poliakanthina* from Queensland. While Andersen and Weir's work was in press, the first author (DAP) collected examples of still another very large new species from New Guinea, described herein as *L. grallator*, during the course of biological surveys in the Kikori Basin of southern Papua New Guinea and the Timika area of southern Irian Jaya. This latter species is the largest known from New Guinea, and it seems rather ironic that it was the last to be collected.

This spate of recent taxonomic work and collecting has necessitated the current review of *Limnometra* in New Guinea. The present paper includes a key to the 5 species known to occur on the island, a description of *L. grallator*, and distribution maps and records for all species treated. The geographical coverage includes New Guinea proper, and certain proximal islands (Salawati, Biak, Yapen, Woodlark, Normanby), but excludes the Bismarcks and Solomons, where certain unresolved taxonomic problems remain. Distributional information for taxa occurring in the Bismarcks is thus included only for those species also occurring on New Guinea proper. Of the 5 species now known to occur on New Guinea, three, *L. kallisto* (Kirkaldy), *L. cilioides* Andersen and Weir, and *L. lipovskii* Hungerford and Matsuda, are widespread within the island. The remaining two species are more circumscribed in their distributions; *L. ciliata* Mayr is found only in the northern half of the island and in the Papuan Peninsula, areas which represent geological terranes accreted to New Guinea from the Miocene onward, while *L. grallator*

n. sp. is found only south of the central mountains on portions of the island that are part of the original Australian craton.

Since *Limnometra* are large and obvious, they are captured by general collectors more often than other aquatic Heteroptera. As a result, a large historical specimen base exists, particularly at the Bishop Museum in Honolulu. These previous collections have been further augmented over the last five years through surveys by the authors in poorly known sections of Irian Jaya and southern Papua New Guinea. The maps presented herein thus provide relatively detailed depictions of species distributions within the island.

All measurements are given in millimeters. CL numbers following certain localities refer to a coding system used by the authors to cross-reference specimens and collection data.

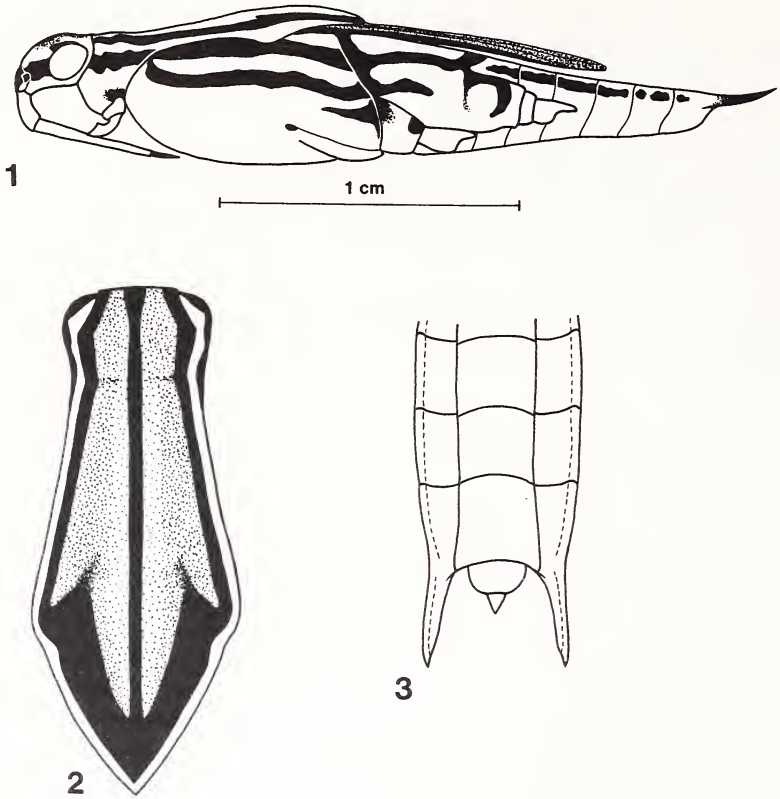
KEY TO SPECIES OF *LIMNOMETRA* OCCURRING ON NEW GUINEA

1. Connexival spines not reaching beyond apex of genital segments; eighth abdominal segment (first genital segment) of male with a backward pointing tooth-like projection on either side ventrally *L. lipovskyi* Hungerford and Matsuda
- Connexival spines reaching beyond apex of genital segments (Fig. 3); eighth abdominal segment (first genital segment) of male without a backward pointing tooth-like projection on either side (may be produced laterally, but not in a tooth-like projection) 2
2. Middle and hind femora dark on basal half, distinctly pale yellowish distally; only macropterous form present *kallisto* (Kirkaldy)
- Legs unicolorous; both macropterous and reduced winged forms may be present 3
3. All legs uniformly pale and straw colored; connexival spines very long, curved from base (Fig. 3); mid femora without long cilia *grallator* D. and J. Polhemus
- All legs dark colored; connexival spines shorter, straight; mid femora with long cilia 4
4. Eighth abdominal segment (first genital segment) of male produced laterally on either side ventrally; macropterous forms with medial dark stripe on pronotum bordered to either side by pale stripes that increase in width posteriorly, these stripes often becoming greatly expanded to form broad pale patches that cover most of the pronotal disk; paired dark stripes on mesopleura always well defined, usually with an area of pale whitish coloration between them *ciliata* Mayr
- Eighth abdominal segment (first genital segment) of male not, or only very weakly, produced laterally on either side ventrally; macropterous forms with medial dark stripe on pronotum bordered to either side by narrow pale stripes of similar width to the medial stripe, these pale stripes retaining an even width throughout their length, not becoming expanded posteriorly; paired dark stripes on mesopleura often obscure or absent, if present then usually lacking a pale whitish area between them *cilioides* Andersen and Weir

***Limnometra grillator*, n. sp.**

Figs. 1–6, 11

Diagnosis: Recognized by its large size (body length in brachypterous males exceeding 19.0 mm), yellowish-brown ground color with sharply contrasting black stripes (Fig. 1), straw colored legs without dark markings, and asymmetrical, V-shaped ventral endosomal sclerite in the male (Fig. 6).



Figs. 1-3. *Limnometra grallator* n. sp. 1. Male, lateral habitus; legs omitted. 2. Male pronotum, showing pattern. 3. Male terminal abdomen, dorsal view, showing length and shape of connexival spines.

Description: *Size.* Macropterous male, length 17.0-17.2, body width 4.9-5.1, head width 2.7-2.8; brachypterous male, length 19.0-21.5, body width 6.0-6.5, head width 2.7-2.8; macropterous female, length 16.5-17.0, body width 4.0-4.5, head width 2.4-2.5; brachypterous female unknown.

Color. Head and pronotum yellowish brown in ground color with very distinct black or dark brownish markings (Figs. 1, 2). Head between eyes with median pair of indistinct longitudinal stripes, these stripes divergent anteriorly, meeting posteriorly; a well defined dark stripe also present along inside margin of each eye; antennae brown, unicolorous, without white markings. Pronotum with relatively narrow, black, longitudinal median stripe bordered by broad pale bands, this median stripe of relatively uniform width throughout. Lateral and posterior portions of pronotum bearing black stripe parallel to margin, this stripe wider posteriorly; entire margin of pronotal lobe outside of this black stripe narrowly yellow (Fig. 2). Thoracic pleura yellowish; propleuron with broad black band behind eye; mesopleuron with two longitudinal black stripes, the upper one continued as an irregular dark stripe on the metapleuron.

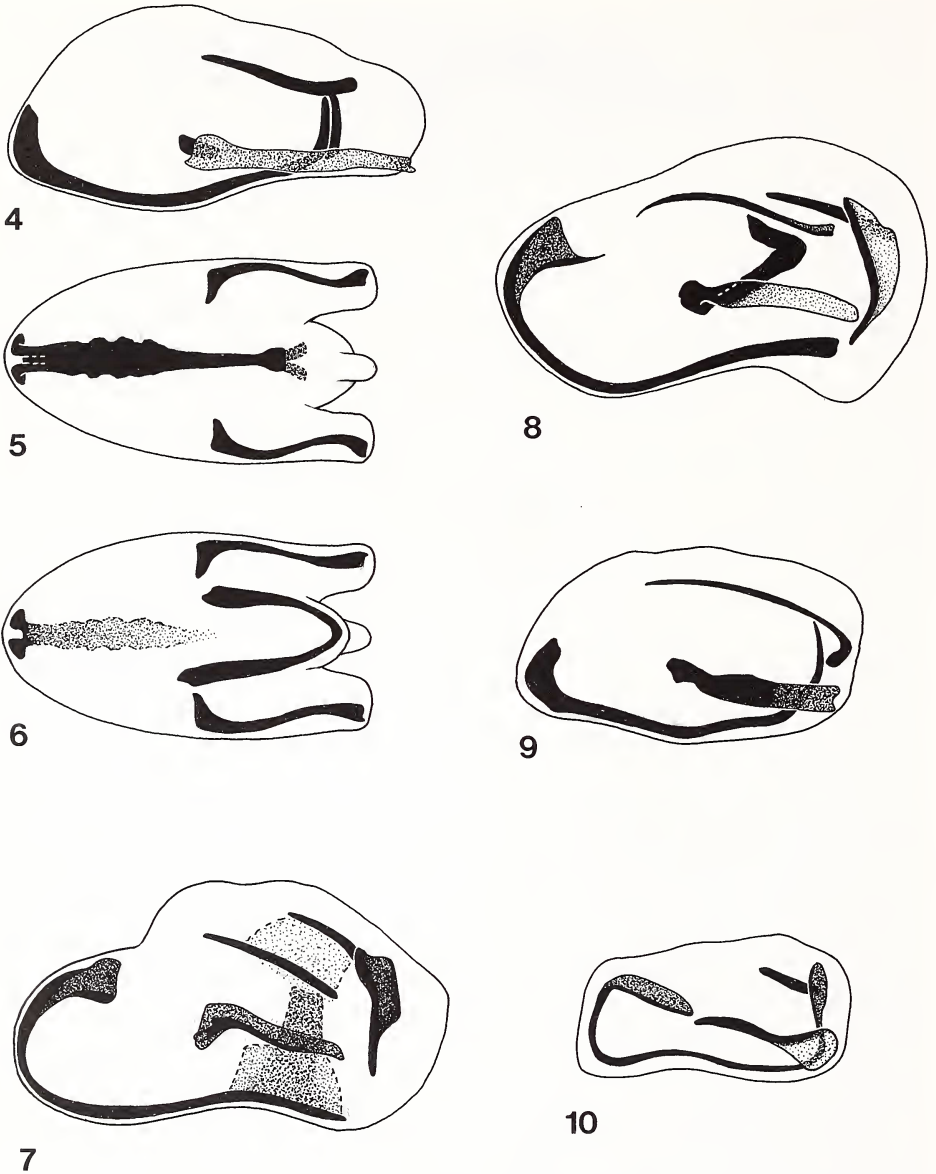
Proacetabulum with an irregular dark spot posteriorly; meso- and metacetabulae each with a dark stripe dividing two pale areas (Fig. 1). Fore wings medium brown to orange brown, with sharply contrasting dark brownish or blackish veins, but without pale subcostal markings. Fore femur and tibia uniformly yellowish brown, infuscated ventrally, fore tarsi dark brown; middle and hind legs uniformly pale yellowish brown, without pale annulations or dark apical markings. Abdomen (when visible in brachypterous form) black dorsally, with connexival margins narrowly yellow; connexival spines dark. Ventral surfaces of head, thorax and abdomen pale yellowish.

Brachypterous male elongate, length $3.4\times$ greatest body width (17.2:5.1). *Head* between eyes (anterior interocular) $1.7\times$ longer than wide (2.0:1.2); lengths of antennal segments I–IV: 5.3, 3.7, 4.5, 5.0; third and fourth rostral segments together about $1.3\times$ maximum head width across eyes (4.1:3.1). *Thorax* with pronotum long (7.9), anterior part $0.8\times$ wide as head (2.7:3.1), pronotal lobe with slightly divergent sides, widest at humeri (3.2), posterior margin angulate; meso- and metasternum with pale recumbent pubescence. *Leg* segments with lengths as follows (femur: tibia: tarsal 1: tarsal 2): fore leg, 8.5, 7.0, 1.2, 1.9; middle leg, 37.5, 38.0, 6.0, 1.0; hind leg, 39.0, 38.0, 2.3, 0.8; fore femora straight and relatively slender, maximum width distinctly less than width of middle femora (0.4:0.6); fore tibia straight; middle femur densely clothed with minute, slender, black, spine-like setae ventrally, and bearing 6–10 short, stout, black, tooth-like spinules distally, but lacking any fringe of long hairs; middle tibia similarly setiferated, bearing a longitudinal row of tiny, slender black spines along entire length; setiferation of hind femur and tibia similar to that of middle leg, but hind femur lacking tooth-like spinules distally. *Wings* narrow, only partially developed, extending half the length of abdomen *Abdomen* long and nearly parallel-sided, widening slightly posteriorly, maximum width about $0.27\times$ total length along dorsal midline (2.7:10.0); lengths of abdominal tergites IV–VI (only segments visible beyond wings) as follows: 1.0, 1.0, 1.2. Connexival spines very long, parallel to slightly divergent and basically horizontal, curving from bases, well over $2\times$ as long as the visible genital segments when viewed from above (Fig. 3); abdominal venter distinctly carinate, sternite VII shorter than sternite VI, with hind margin simply concave. *Genital segments* relatively small; venter of segment VIII distinctly shorter than that of segment VII; pygophore parallel sided, rounded distally; parameres small, rounded distally, sparsely set with extremely short setae; proctiger conical distally; vesical armature relatively simple; dorsal plate not well defined; dorsal sclerite robust, symmetrical, with distinctly widened and curved short distal part, basal part divided (Fig. 5); lateral sclerites extremely large and long (Fig. 4); accessory sclerites not evident; ventral sclerite V-shaped, asymmetrical (Fig. 6).

Macropterous female considerably smaller than brachypterous male, but otherwise similar in general structure and coloration, with following exceptions: forewings long, reaching to tips of connexival spines, coloration brown with darker veins, lacking pale subcostal markings; gonocoxae relatively small, exposed ventrally; proctiger small, elongate, semi-acuminate.

Macropterous male: Similar to brachypterous male in general structure and coloration, but smaller in overall body dimensions (see above). Wings medium brown, with slightly darker brown venation, lacking pale subcostal markings, extending to tips of abdominal connexival spines.

Brachypterous female: Unknown.



Figs. 4-6. Male endosomal structures of *Limnometra grallator* n. sp. 4. Lateral view. 5. Dorsal view. 6. Ventral view (note asymmetrical, V-shaped ventral sclerite).

Figs. 7-10. Male endosomal structures of *Limnometra* species occurring on New Guinea (all shown in lateral view). 7. *Limnometra ciliata* Mayr. 8. *Limnometra ciliodes* Andersen and Weir. 9. *Limnometra kallisto* (Kirkaldy). 10. *Limnometra lipovskii* Hungerford and Matsuda.

Table 1. Comparison of external structural characters between *Limnometra grallator* n. sp. and *Limnometra ciliodes* Andersen and Weir:

Character	<i>ciliodes</i>	<i>grallator</i>
Leg color	Dark brown	Yellow
Setae on middle femur	Long	Short
Length of legs	Long	Extremely long
Ratio of antennal segments II/IV	25/18 (male)	23/38 (male)
Color of figures on head vertex	Black	Brown
Macropterous pronotal margins	Broadly dark	Narrowly dark
Mesopleural coloration	Light, or with two modest stripes	With two strong black stripes
Connexival spines	Long, straight, and slightly divergent distally	Extremely long, curved from base

Etymology: The name *grallator* (Latin, masculine), means “one who walks on stilts”, and refers to the extremely long legs of the brachypterous males in this species.

Discussion: Among New Guinea *Limnometra* species, *L. grallator* n.sp. is superficially most similar to *L. ciliodes* Andersen and Weir, but may be separated by the external characters given in the comparison table above.

The structure of the endosomal sclerites is also very different between the two species (compare Figs. 4 and 8). In particular, *L. grallator* has an asymmetrical, V-shaped ventral sclerite (Fig. 6) quite unlike the symmetrical, U-shaped ventral sclerite of *L. ciliodes*, but similar to the state seen in *L. kallisto*. The endosoma of *L. ciliodes* also bears several accessory lateral sclerites similar to those seen in *L. ciliata* (compare Figs. 7 and 8); such accessory sclerites are lacking in *L. grallator* and *L. kallisto* (Figs. 4, 9).

Based on current records, *L. grallator* is confined to the premontane foreland of the central mountain ranges in southern New Guinea, from the Kikori River basin westward to at least the Timika area (Fig. 11). Individuals prefer small, shaded forest streams, where they skate on sheltered pools, often occurring sympatrically with *L. kallisto*. In contrast to most *Limnometra* species, in which macropterous morphs predominate, the macropterous forms of *L. grallator* appear to be very uncommon, with only a few examples currently known.

Distribution: Southern New Guinea (Fig. 11).

Material examined (all specimens brachypterous unless otherwise noted):

HOLOTYPE, brachypterous male, PAPUA NEW GUINEA, Southern Highlands Prov., branch of upper Kara Creek (trib. to Digimu River), 5.5 km. S. of Moro oil camp, on road to Ridge camp, 900 m., water temp. 20°C., 12 March 1995, D. A. Polhemus (BPBM).

PARATYPES: PAPUA NEW GUINEA, Gulf Prov.: 2 males, 1 female (macropterous), Omo River at Omo, 40 m., water temp. 24°C., 28 February 1995, D. A. Polhemus (BPBM); 1 male (macropterous), Lubu River above Omo, 50 m., water temp. 19°C., 1 March 1995, D. A. Polhemus (BPBM); 1 male, 3 females, Wamivei Creek, near Veiru Creek, Kikori River delta, SW of Kikori, 40 m., water temp. 25°C., 5 March 1995, D. A. Polhemus (BPBM). Southern Highlands Prov.: 15 males, 8 females, same data as holotype (BPBM, USNM, JTPC); 2 males, 1 female, branch

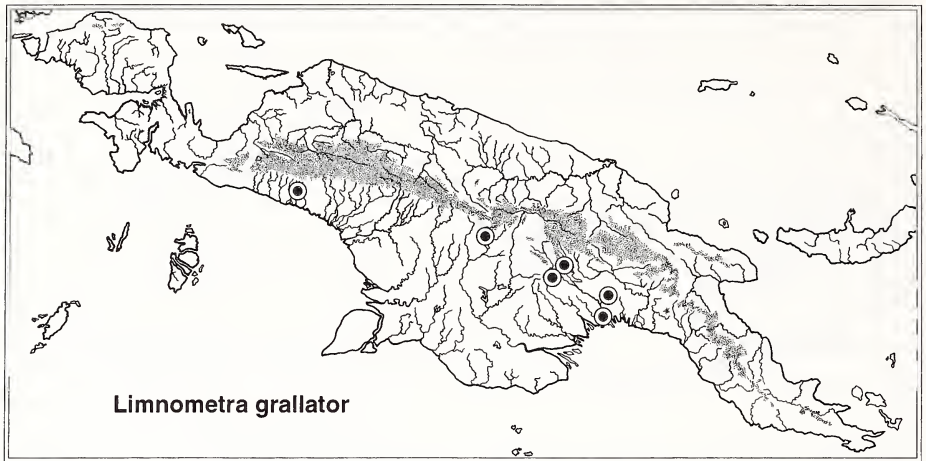


Fig. 11. Distribution of *Linnometra grillator* n. sp. in New Guinea. Stippling indicates areas above 2000 m.

of upper Kara Creek (trib. to Digimu River), 3.5 km. S. of Moro oil camp, on road to Ridge camp, 900 m., water temp. 20°C., 13 March 1995, D. A. Polhemus (BPBM); 1 male, 1 female, small rocky creek in disturbed forest, approx. 1.0 km. N. of Tubage, NE of Moro, 1000 m., water temp. 21°C., 14 March 1995, 14:30–15:00 hrs.; 22 March 1995, D. A. Polhemus (BPBM); 1 male, small rocky creek approx. 1.25 km. N. of Tubage, NE of Moro, 1000 m., water temp. 20°C., 14 March 1995, 15:00–15:30 hrs.; 22 March 1995, D. A. Polhemus (BPBM); 1 male, rocky stream at Ludesa Mission, N. of Mt. Bosavi, 700 m., water temp. of stream 23°C., 20 March 1995, D. A. Polhemus (BPBM). Western Prov.: 1 male, 2 females, Olsobip, Fly River, 400–600 m., August 1969, J. and M. Sedlacek (BPBM).

INDONESIA, Irian Jaya Prov.: 2 males, 1 female, Tributary to Iwaka River, approx. 3 km. W. of Kuala Kencana, N. of Timika, 4°24.08 S, 136°50.10 E, 300 ft., water temp. 25°C., pH 6.95, 17 January 1997, 09:30–12:00 hrs., CL 7042, D. A. Polhemus (NMNH, LIPI); 6 males, 7 females, same locality as preceding except 26 March 1997, D. A. Polhemus, J. T. Polhemus, and T. Tabuni (JTPC, LIPI); 6 males, trib. to upper Minajerwi River, approx. 1 km. E of Mile 50 tank farm on Tembapapura Road, 4°16.99 S, 137°01.56 E, 1650 ft., water temp. 23°C., 24 January 1997, 12:00–14:00 hrs., CL 7061, D. A. Polhemus (NMNH, LIPI).

Linnometra ciliata Mayr

Figs. 7, 12

Linnometra ciliata Mayr 1865, Verh. zool.-bot. Ver. Wien, 15: 444 (Type, male, Java, NHMW)

Discussion: This is the most widespread of all *Linnometra* species, occurring in lowland habitats from Indochina through the Malay Archipelago to New Guinea, the Bismarcks, the Solomons, Fiji and Guam.



Fig. 12. Distribution of *Limnometra ciliata* Mayr in New Guinea. Stippling indicates areas above 2000 m.

Distribution: New Guinea (Fig. 12), Solomons (Guadalcanal), New Britain, Guam, Fiji, Halmahera, Ambon, Bali, Sumatra, Borneo, Celebes, Mindanao, Luzon, Marinduque, Thailand, Malaysia.

New Guinea records:

PAPUA NEW GUINEA: Central Prov.: 1 female, Brown River, 5 m., stream pools, 23 October 1960, J. L. Gressitt (BPBM). East Sepik Prov.: 1 male, Brandi School, nr. Wewak, CL 1795, 10 September 1983, D. A. and J. T. Polhemus (JTPC); 1 male, Mandi Creek, E. of Wewak, CL 1797, 10 September 1983, D. A. and J. T. Polhemus (JTPC); 1 male, Yemogu Creek, 2 km. W. of Tring, CL 1805, 12 September 1983, D. A. and J. T. Polhemus (JTPC); 2 males, 2 females, waterfall nr. Pasam, CL 1798, 10 September 1983, D. A. and J. T. Polhemus (JTPC); 3 females, Ramura, NW of Wewak, CL 1801, 11 September 1983, D. A. and J. T. Polhemus (JTPC). Madang Prov.: 1 male, 1 female, Friedrichwilhelmshafen, 1901, Biro (JTPC). Milne Bay Prov.: 1 male, S. of Alotau, 29 September 1989, R. N. B. Prior (OXUM). East New Britain Prov.: 2 males, 4 females, Kerawat, Gazelle Peninsula, 60 m., 29–31 August 1955, J. L. Gressitt (BPBM). West New Britain Prov.: 2 males, West New Britain, Tamari, rainwater tank, 14 January 1989, R. N. B. Prior (OXUM); 2 males, 2 females, West New Britain, Buluma, nr. Dami, rain water pit, 17 January 1989, R. N. B. Prior (OXUM); 1 male, West New Britain, Blalla Apulpu village, freshwater creek, 27 January 1989, R. N. B. Prior (OXUM).

INDONESIA: Irian Jaya Prov.: 1 male, Manokwari, T. Barbour (JTPC); 7 males, 6 females, Yapen Is., Kabupaten Waropen, small rocky stream at Kainsami, 22 October 1991, CL 2661, R. Ubaidillah (JTPC, BPBM).

Limnometra cilioides Andersen and Weir

Figs. 8, 13

Limnometra cilioides Andersen and Weir 1997, Invert. Taxon., 11 (2): 242 (Type, macropterous male, N. Queensland, Australia, ANIC)



Fig. 13. Distribution of *Limnometra ciliodes* Andersen and Weir in New Guinea. Stippling indicates areas above 2000 m.

Discussion: All previous records of *Limnometra cursitans* from New Guinea apparently represent this species instead. It is a species of the lowlands, with no records from above 50 m. elevation (Fig. 13). Further discussion of this species' structural characters and relationships, along with a detailed map of its distribution within Australia, is provided in Andersen and Weir (1997).

Distribution: Australia, New Guinea (Fig. 13).

New Guinea records:

PAPUA NEW GUINEA: Gulf Prov.: 6 males, 15 females, roadside ponds in lowland forest, 2 km. S. of Kopi oil camp, N. of Kikori, 20 m., water temp. 24°C., 27 February 1995, D. A. Polhemus (BPBM). Western Prov.: 3 males, 4 females, Fly River above Kiunga, CL 1774, 3 September 1983, D. A. and J. T. Polhemus (JTTC).

INDONESIA: Irian Jaya Prov.: 6 macropterous males, Tanamerah, Station 31, creek in rainforest, 13 June 1957, D. F. M. (ANIC); 2 macropterous males, 5 macropterous females, 3 apterous males, 8 apterous females, Merauke, 27 March 1939, R. G. Wind (SEMK); 1 female, Bernhard Camp, 50 m., July 1938, J. Olthof, Neth. Ind.-American New Guinea Exp. (RMNH); 1 female, Teluk Bintuni, Babo, 13 August 1941, E. Linquist (NC); 1 male, 1 female, River Tor (mouth), 4 km. E. of Hol Maffin, 4 July 1959, T. C. Maa (BPBM); 5 males, 3 females, swamp forest pond S. of Walio oil field, nr. Kasim, 7 m. (20 ft.), CL 2620, water temp. 30°C., 29 Sept. 1991, J. T. and D. A. Polhemus (JTTC, BPBM).

Limnometra cursitans (Fabricius)

Gerris cursitans Fabricius 1794, Entomol. Syst. 4: 192 (Type, macropterous male, Nova Hollandia [= Australia], ZMUC)

Limnometra cursitans Banks 1909, Phila. J. Sci. 4: 583.

Limnometra poliakanthina Nieser and Chen 1992, Tijdschr. Entomol. 135: 23 (Type,



Fig. 14. Distribution of *Limnometra kallisto* (Kirkaldy) in New Guinea. Stippling indicates areas above 2000 m.

macropterous male, N. Queensland, Australia, OXUM). Syn. by Andersen and Weir 1997, *Invert. Taxon.* 11: 236.

Discussion: *Limnometra cursitans* has been recorded from New Guinea in the literature, but these records were based on misidentifications, since the true identity of this species was misinterpreted by Hungerford and Matsuda (1958) in their revision of *Limnometra*, an error subsequently followed by Nieser and Chen (1992). As now reinterpreted by Andersen and Weir (1997), *L. cursitans* is restricted to Australia, with all previous records of this species in New Guinea being referable to *L. ciliodes* Andersen and Weir.

Distribution: Australia.

New Guinea records: none known.

Limnometra kallisto (Kirkaldy)

Figs. 9, 14

Gerris kallisto Kirkaldy 1899, *Ann. Soc. Entomol. Belg.* 43:506 (Type, female, Mysol [= Misool Is.], supposed to be in ISNB, apparently lost).

Limnometra kallisto Lundblad 1933, *Arch. Hydrobiol., Suppl.* 12, *Tropische Binnengewasser* 4: 371.

Discussion: This is the most common and widespread species of *Limnometra* in New Guinea, and the only species, other than the highly precinctive *L. grallator*, to be found regularly at elevations above 100 meters (Fig. 14). It occupies a wide range of habitats, and individuals from different localities can vary greatly in size. In contrast to other New Guinea *Limnometra* species, which prefer slow waters, *L. kallisto* is often found in sheltered eddies along the margins of swift upland streams. Adults will fly readily if disturbed or pursued, alighting amid streamside vegetation. This well developed capacity for flight likely accounts for the species' broad distri-

bution within New Guinea, and for its tendency to exploit temporary habitats such as rain pools in forest roads.

Distribution: Misool (type locality), Aru, Morotai, New Guinea (Fig. 14), New Ireland, Solomons (Bougainville, Guadalcanal, Kolombangara, Malaita, San Cristoval, Vella Lavella, Choiseul).

New Guinea records:

PAPUA NEW GUINEA: Central Prov.: 1 male, 2 females, 3 km. S. of Vanapa, Brown River road, 200 m., 17–26 May 1965, around forest pool, W. A. Steffan (BPBM); 1 male, Mt. Suckling, 14 June 1972, W. H. Ewers (BPBM); 3 males, 1 female, Eio Creek, nr. Baruanumu, CL 1840, 22 September 1983, D. A. and J. T. Polhemus (JTTC). East Sepik Prov.: 1 male, Suanimbu, E. of Maprik, 180 m., 14 January 1960, T. C. Maa (BPBM); 1 female, Bainyik, nr., Maprik, 225 m., 20–21 July 1961, J. L. and M. Gressitt (BPBM). Eastern Highlands Prov.: 1 male, Kassam Pass, 1460 m., 18 August 1963, J. Sedlacek (BPBM); 1 male, 18 km. S. of Okapa, 1300 m., 2 June 1967, on water trickle, G. A. Samuelson (BPBM). Gulf Prov.: 2 males, 2 females, Lubu River above Omo, 50 m., water temp. 19°C., 1 March 1995, D. A. Polhemus (BPBM); 1 female, Wamivei Creek, near Veiru Creek, Kikori River delta, SW of Kikori, 40 m., water temp. 25°C., 5 March 1995, D. A. Polhemus (BPBM). Madang Prov.: 1 male, 1 female, Seleo, Berlinhaf. [Berlinhafen], 1896, Biro (JTTC); 1 female, Adelbert Mtns., Wanuma, 800–1000 m., 26 October 1958, J. L. Gressitt (BPBM). Milne Bay Prov.: 3 males, 2 females, Modewa Bay, Modewa, 0–50 m., 22 December 1956, L. J. Brass, Fifth Archbold Expedition to New Guinea (JTTC); 1 female, Woodlark Is., Murua, Kulumadau Hill, 16 February 1957, W. W. Brandt (BPBM); 9 males, 4 females, Normanby Is., Wakaiuna, Sewa Bay, 11–20 December 1956, W. W. Brandt (BPBM); 1 male, 3 females, Naura, 5 km. W. of Milne Bay, 7 November 1965, R. Straatman (BPBM); 1 female, Mt. Dayman, Maneau Range, 700 m., N. slope, 13–20 July 1953, G. M. Tate (JTTC); 1 male, 1 female, S. of Alotau, 29 September 1989, R. N. B. Prior (OXUM). Morobe Prov.: 2 males, 4 females, Garaina, 800 m., 15–16 January 1968, J. and M. Sedlacek (BPBM); 1 female, 16 km. W. of Mumeng, 80 km. N. of Wau, 900–1500 m., May 1962, J. Sedlacek (BPBM); 4 males, 7 females, Huon Peninsula, Finschhafen, 80–200 m., 13 April 1963, J. Sedlacek (BPBM); 1 male, Huon Peninsula, Pindiu, 870–1500 m., 21–22 April 1963, J. Sedlacek (BPBM); 1 male, Ulap, 800–1100 m., September 1968, N. L. H. Krauss (BPBM); 1 female, Lae, July 1944, F. E. Skinner (BPBM); 1 female, Wampit Vally, nr. Gurakor village, 950 m., 7 July 1957, D. E. Hardy (BPBM); 1 female, Mt. Lawson, N. Kakoro Gulf, 50–200 m., 16 March 1974, Gressitt and Reni (BPBM). New Ireland Prov.: 3 males, 8 females, Gilingil Plain, 2 m., 16 July 1956, J. L. Gressitt (BPBM); 2 males, ridge above "Camp Bishop", 15 km. up Kait River, 250–750 m., 14 July 1956, J. L. Gressitt (BPBM); 1 male, 1 female, old German road W. of Karu Plateau, 40 km. N. of Namatanai, 9 December 1969, J. E. Tobler (JTTC). Southern Highlands Prov.: 1 male, slow trib. to Mubi River, SE of Kantobo, 380 m., water temp. 22°C., 8 March 1995, D. A. Polhemus (BPBM); 2 males, 4 females, Auwa Creek, nr. Kafka, NW of Kantobo, 520 m., water temp. 22°C, 9 March 1995, D. A. Polhemus (BPBM); 2 males, 2 females, swift clear trib. to Digimu River, 1 km. above Sorotage, 400 m., water temp. 23.5°C., 10 March 1995, D. A. Polhemus (BPBM); 3 males, 7 females, Ofake Creek, trib. to Mubi River, 2 km. NW of Kantobo, 380 m., water temp. 23.5°C., 11 March 1995, D. A.

Polhemus (BPBM); 1 male, 4 females, branch of upper Kara Creek (trib. to Digimu River), 3.5 km. S. of Moro oil camp, on road to Ridge camp, 900 m., water temp. 20°C., 13 March 1995, D. A. Polhemus (BPBM); 3 males, 2 females, small forest tributary to upper Mubi River at Swinging Bridge, nr. Tubage, NE of Moro, 900 m., water temp. 20°C., 14 March 1995, D. A. Polhemus (BPBM); 2 males, 1 female, small rocky creek in disturbed forest, approx. 1.0 km. N. of Tubage, NE of Moro, 1000 m., water temp. 21°C., 14 March 1995, 14:30–15:00 hrs.; 22 March 1995, D. A. Polhemus (BPBM); 1 male, impounded roadside stream in forest at Moro oil camp, 840 m., water temp. 25°C., 14 March 1995, 16:00–17:00 hrs.; 24 March 1995, D. A. Polhemus (BPBM); 7 males, 5 females, small rocky stream on N. slope of Mt. Bosavi, 1250 m., water temp. 19°C., 16 March 1995, 14:30–17:00 hrs.; 17 March 1995, D. A. Polhemus (BPBM); 3 males, 2 females, swift rocky stream in moss forest on N. slope of Mt. Bosavi, 1400 m., water temp. 18°C., 19 March 1995, D. A. Polhemus (BPBM). East New Britain Prov.: 1 male, Gazelle Peninsula, upper Warangoi, 250–600 m., 28–30 November 1962, J. Sedlacek (BPBM). West Sepik Prov.: 1 male, Amok [nr. Aitape], 165 m., 6 January 1960, T. C. Maa (BPBM); 1 male, 3 females, Dreikkir, 350 m., 23 June 1961, J. L. and M. Gressitt (BPBM); 3 males, Telefomin, March–June 1971, A. B. Mirza (BPBM); 2 females, Torricelli Mtns., Mobitei, 750 m., 1–15 April 1959, W. W. Brandt (BPBM). Western Prov.: 1 male, Fly River, Olsobip, 400–500 m., August 1969, J. and M. Sedlacek (BPBM); 7 males, 3 females, Fly River above Kiunga, CL 1774, 3 September 1983, D. A. and J. T. Polhemus (JTPC). Western Highlands Prov.: 1 male, Baiyer River, 1150 m., 17 October 1958, J. L. Gressitt (BPBM); 1 male, Kumur, upper Jimi Valley, 1000 m., 13 July 1955, J. L. Gressitt (BPBM).

INDONESIA: Irian Jaya Prov.: 1 female, Humboldt Bay Dist., Pukusam Dist., W. of Tami River, June 1937 (JTPC); 7 males, 4 females, Bernhard Camp, 100 m., 13 April 1939, L. J. Toxopeus, Neth. Ind.-American New Guinea Exp. (RMNH); 2 males, 5 females, Vogelkop, Bomberi, 700–900 m., 6 June 1959, T. C. Maa (BPBM); 3 males, 3 females, Biak Is., Kampong Landbouw, 50–100 m., 29 May 1959, J. L. Gressitt (BPBM); 1 male, Nabire, S. Geelvink Bay, 0–30 m., 2–9 July 1962, J. L. Gressitt (BPBM); 5 males, 3 females, Waris, S. of Hollandia, 450–500 m., 24–31 July 1959, T. C. Maa (BPBM); 3 males, Genjam, 40 km. W. of Hollandia, 100–200 m., 1–10 March 1960, T. C. Maa (BPBM); 1 male, 3 females, Kebar Valley, W. of Manokwari, 550 m., 4–31 January 1962, S. Quate (BPBM); 1 female, Hollandia (Kota Bharu), 13 March 1960, T. C. Maa (BPBM); 3 males, 2 females, Central Mtns., Archbold Lake, 760 m., 26 November–3 December 1961, S. and L. Quate (BPBM); 4 males, 7 females, W. of Sentani, 90+ m., 24 January 1959, T. C. Maa (BPBM); 3 males, 4 females, Fak Fak, S. coast Bomberai, 9 June 1959, T. C. Maa (BPBM); 2 males, 1 female, Star Mtns., Sibil Valley, 1245 m., 31 October 1961, S. Quate (BPBM); 12 males, 7 females, Salawati Is., Wajaar River, Wagon Mountains, W. of Sorong, CL 2623, 0–30 m. (0–100 ft.), water temp. 28°C., 30 Sept. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 2 males, 5 females, small forest trib. to Klagalo River at old Klagagi oil field, SE of Sorong, CL 2628, 45 m. (150 ft.), water temp. 25.5°C., 1 Oct. 1991, D. A. Polhemus (JTPC, BPBM); 4 males, 4 females, pools in muddy lowland rain forest streambed, 28 km. NE of Kasim on pipeline road, CL 2630, 15 m. (50 ft.), 2 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 5 males, 5 females, 8 immatures, upper Kali Mati River, 10 km. N. of Fak Fak, CL 2633,

275 m. (900 ft.), water temp. 23°C., 10 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 1 male, pools in dry bed of middle Kali Mati River, 8 km. N. of Fak Fak, CL 2634, 230 m. (750 ft.), 10 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 8 males, 7 females, Mupi River, above Warkomi, Arfak Mountains, 38 km. S. of Manokwari, CI 2646, 150 m. (500 ft.), water temp. 19°C., 18 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 7 males, 5 females, Saumarin River, nr. Warkomi, Arfak Mountains, 42 km. S. of Manokwari, CL 2647, 90 m. (300 ft.), water temp. 25°C., 18 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 4 males, 2 females, Kabori River, nr. Warkomi, Arfak Mountains, 41 km. S. of Manokwari, CL 2648, 15 m. (50 ft.), water temp. 25°C., 18 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 3 males, 3 females, small rocky stream at Aimasi Hulu, Arfak Mountains, 65 km. SW of Manokwari, CL 2649, 140 m. (450 ft.), water temp. 25°C., 19 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 7 males, 3 females, intermittent stream with pools at Kuala Kencana light industrial park, N. of Timika, 4°26.21 S, 136°51.84 E, 300 ft., water temp. 25°C., 17 January 1997, 14:00–15:00 hrs, and 20 January 1997, 09:30–11:30 hrs., CL 7043, D. A. Polhemus (USNM, LIPI); 4 males, 4 females, small forest streams and pools along Kopi River road, NE of Timika, 4°25.25 S, 136°56.44 E, 400 ft., water temp. 27°C., 18 January 1997, 08:00–11:00 hrs., CL 7044, D. A. Polhemus (USNM, LIPI); 4 females, small rocky stream at Mile 50 storage tank site on Tembapapura Road, 34 km. N. of Timika, 4°16.99 S, 137°00.86 E, 2000 ft., water temp. 22°C., 19 January 1997, 09:00–10:00 hrs., CL 7046, D. A. Polhemus (USNM, LIPI); 1 male, pond and blackwater stream 2.4 km. S. of Mile 50 storage tank site on Tembapapura Road, 31.5 km. N. of Timika, 4°17.93 S, 136°59.98 E, 1900 ft., water temp. 25°C., 19 January 1997, 11:15–12:00 hrs., CL 7047, D. A. Polhemus (USNM); 1 male, 5 females, sago swamp and swift roadside drainage ditch at Km. 22 on Portsie road, 15 km. S. of Timika, 4°38.74 S, 136°53.93 E, 50 ft., water temp. 27°C., pH 7.45, 21 January 1997, 11:00–11:30 hrs., CL 7054, D. A. Polhemus (USNM, LIPI); 4 males, 5 females, upper Minajerwi River and swift tributary, approx. 1 km. E. of Mile 50 tank farm on Tembapapura Road, 4°16.99 S, 137°01.56 E, 1650 ft., water temp. 23°C., 24 January 1997, 12:00–14:00 hrs., CL 7061, D. A. Polhemus (USNM, LIPI); 3 males, 3 females, small rocky stream along N. side of P. T. Freeport Indonesia Etna Bay exploration camp, head of Etna Bay, 0–60 m. (0–200 ft.), 3°58.10'S, 134°57.68'E, water temp. 25–27°C., 28–29 March 1997, CL 7077, D. A. and J. T. Polhemus (USNM). Maluku Prov.: 2 males, 1 female, Aru Archipelago, Trangan Is., 1 km. S. of Popjetur, 6°48'S, 134°4'E, 10 July 1994, A. H. Kirk-Spriggs (NMWC).

Limnometra lipovskii (Kirkaldy)

Figs. 10, 15

Limnometra lipovskii Hungerford & Matsuda 1958, Univ. Kansas Sci. Bull. 39: 399 (Type, macropterous male, Guadalcanal, SEMK).

Discussion: *Limnometra lipovskii* is rather uncommon and localized in New Guinea, being found only in the coastal lowlands or along larger rivers (Fig. 15), and few series from the island are present in major collections. This species was overlooked completely by Nieser and Chen (1992) in the review of *Limnometra* of the Indo-



Fig. 15. Distribution of *Limnometra lipovskii* Hungerford and Matsuda in New Guinea. Stippling indicates areas above 2000 m.

Australian region; neither it or any other of the species occurring in New Guinea is included in their key.

Distribution: New Guinea (Fig. 15), Solomons (type locality: Guadalcanal), Australia, Halmahera.

New Guinea records:

PAPUA NEW GUINEA: Gulf Prov.: 2 males, 2 females, roadside ponds in lowland forest, 2 km. S. of Kopi oil camp, N. of Kikori, 20 m., water temp. 24°C., 27 February 1995, D. A. Polhemus (BPBM). Western Prov.: 1 male, 1 female, Fly River above Kiunga, CL 1774, 3 September 1983, D. A. and J. T. Polhemus (JTPC); 1 male, 1 female, Fly River at Kiunga, CL 1864, 5 September 1983, D. A. and J. T. Polhemus (JTPC). East Sepik Prov.: 1 female, Ramumba, NW of Wewak, CL 1801, 11 September 1983, D. A. and J. T. Polhemus (JTPC).

INDONESIA, Irian Jaya Prov.: 2 males, 1 immature, Biak Is., Kampong Landbouw, 50–100 m., 27 May 1959, J. L. Gressitt (BPBM); 2 males, 3 females, swamp forest pond S. of Walio oil field, nr. Kasim, CL 2620, 7 m. (20 ft.), water temp. 30°C., 29 Sept. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 2 males, 1 female, Salawati Is., Wajaar River, Wagom Mountains, W. of Sorong, CL 2623, 0–30 m. (0–100 ft.), water temp. 28°C., 30 Sept. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 10 males, 18 females, Batuputih River nr. Krooy, 3 km. NW of Kaimana, CL 2639, 30 m. (100 ft.), water temp. 26°C., 12 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 1 male, Airtiba River, 3 km. NW of Krooy, NW of Kaimana, CL 2640, 15 m. (50 ft.), water temp. 26°C., 13 Oct. 1991, J. T. and D. A. Polhemus (JTPC, BPBM); 1 male, wetlands in former Ajkwa River channel near Km. 21 on Portsited road, 16 km. S. of Timika, 4°39.91 S, 136°53.83 E, 50 ft., water temp. 26.5°C., pH 7.4, 21 January 1997, 10:00–11:00 hrs., CL 7053, D. A. Polhemus (NMNH); 3 males, 2 females, pond and blackwater stream 2.4 km. S. of Mile 50 storage tank site on Tembagapura Road, 31.5 km. N. of Timika, 580 m., 4°17.93 S, 136°59.98

E., water temp. 25°C., 5 March 1997, 11:00–12:00 hrs., CL 7047, D. A. and J. T. Polhemus (USNM, JTPC). Maluku Prov.: 1 male, 1 female, Aru Archipelago, Trangan Is., 1 km. E. of Ngalgull, 90 m., 6°48'S, 134°4'E, 29 July 1994, A. H. Kirk-Spriggs (NMWC).

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The holotype of *Limnometra grillator* is deposited in the Bishop Museum, Honolulu (BPBM); paratypes are held in that collection, the J. T. Polhemus collection, Englewood, Colorado (JTPC), and the Museum Zoologicum Bogoriense, Bogor (LIPI).

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LITERATURE CITED

- Andersen, N. M. and T. A. Weir. 1997. The gerrine water striders of Australia (Hemiptera: Gerridae): taxonomy, distribution and ecology. *Invertebrate Taxon.* 11(2):203–299.

- Hungerford, H. B. and R. Matsuda. 1958. The *Tenagonus-Limnometra* complex of the Gerridae. Univ. Kansas Sci. Bull. 39:371-457.
- Nieser, N. and P. Chen. 1992. Revision of *Limnometra* Mayr (Gerridae) in the Malay Archipelago. Notes on Malesian aquatic and semiaquatic bugs (Heteroptera), II. Tijds. Entomol. 135:11-26.

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